

AGREEMENT
BETWEEN THE DEPARTMENT OF ENERGY
OF THE UNITED STATES AND
THE POWER REACTOR AND NUCLEAR FUEL
DEVELOPMENT CORPORATION OF JAPAN
IN THE FIELD OF LMFBR SAFETY

This Agreement is entered into between the Department of Energy of the United States (DOE) and the Power Reactor and Nuclear Fuel Development Corporation of Japan (PNC); hereinafter referred to as the Parties, for the joint development and validation of safety analysis models and computer codes.

This Agreement is entered into as provided in Article 3.7 of the Agreement between the United States Department of Energy and the Power Reactor and Nuclear Fuel Development Corporation of Japan in the Field of Liquid Metal Cooled Fast Breeder Reactors dated 31 January 1979.

ARTICLE 1

OBJECTIVE

The objective of this Agreement is to provide for joint development and validation of a safety analysis computer code, by the exchange of Safety Program information and the application of experimental data generated through in-pile and out-of-pile measurements.

ARTICLE 2

SCOPE

To accomplish the objective of Article 1, a one-year collaborative research and development project will be undertaken by the Parties. The responsibilities of DOE and PNC shall be as follows:

A. DOE

1. Providing PNC with the computer code identified in Appendix A, along with operating instructions and descriptive documentation.
2. Continuing computer code validation utilizing TREAT and out-of-reactor experimental data as described in Appendix B and the results of PNC calculations and studies.
3. Accepting the assignments of PNC or PNC contractor staff, not to exceed a total of two individuals at any given time, to one or both of the following sites: Argonne National Laboratory (ANL), Chicago; ANL, Idaho.
4. Providing PNC with copies of: documents published during the term of this Agreement which describe the SAS4A code, code models, and the results of validating experiments; TRANSIT-HYDRO transition phase computer code progress reports published during the term of this Agreement; modified Fast Reactor Safety Program quarterly progress reports issued during the term of this Agreement by the Fast Reactor Safety Technology Management Center at ANL; and corrections to coding and/or modeling errors discovered in SAS4A during and after the term of this Agreement.

B. PNC

1. Participating in the development and validation of SAS4A by assigning up to two PNC or PNC contractor staff to assist in the continuing development and validation of the SAS4A computer code.

2. Participating in the utilization of SAS4A by providing to DOE, in the English language, results of calculations and studies carried out by the PNC or its contractors using the SAS4A computer code.
3. Promptly notifying DOE, in the English language, when any SAS4A coding and/or modeling errors are discovered, of the circumstances, corrective measures taken, and results of corrections. This notification shall continue after the term of this Agreement.
4. Providing DOE with progress reports by PNC and its contractors relating to the PNC LMFBR safety program. PNC shall provide abstracts of all reports in English and, on a best effort basis, shall provide English translations of these reports.
5. Providing DOE, on request, with copies of PNC and PNC contractor computer codes, results of computer code calculations, and out-of-reactor test data in the area of fast reactor safety.

ARTICLE 3

MANAGEMENT

1. The DOE/PNC Joint Coordinating Committee established pursuant to the exchange of letters between ERDA and PNC, dated January 19, 1976, and March 5, 1976, shall be responsible for the management (review, evaluation, assessment, and approval) of the Joint Safety Program to be conducted under this Agreement.
2. For periods between meetings of the DOE/PNC Joint Coordinating Committee, each Party's Safety Working Group Heads shall act on the Party's behalf

in all matters concerning cooperation under this Agreement, as provided for in Article 4.3 of the January 31, 1979, LMFBR Agreement.

ARTICLE 4

USE AND DISCLOSURE OF INFORMATION

1. The Parties shall exchange, as agreed and on a mutually beneficial basis, scientific and technical information, documents and results of research and development related work carried out under this Agreement. Such information shall be limited to that which they have the right to disclose, either in their possession or available to them from the cooperative activities described in Article 2.
2. Reports of joint activities carried out under this Agreement shall be published as joint publications, as mutually agreed by both Parties.
3. Both Parties agree that information developed and exchanged under this Agreement may be given wide distribution. Such information, except as noted in paragraphs 4 and 5 of this article, may be made available to the public by either Party through customary channels and in accordance with normal procedures of the Parties.
4. It is recognized by both Parties that in the process of exchanging information, or in the process of other cooperation, the Parties may provide to each other "industrial property of a proprietary nature." Such property, including trade secrets, inventions, patent information, and know-how, made available hereunder, which is acquired by either Party prior to, or outside, the course of these activities, and which bear a restrictive

designation, shall be respected by the receiving Party and shall not be used for commercial purposes or made public without the consent of the transmitting Party. Such property is defined as:

- a. of a type customarily held in confidence by commercial firms;
 - b. not generally known or publicly available from other sources;
 - c. not having been made available previously by the transmitting Party to others without an agreement concerning its confidentiality;
and
 - d. not already in the possession of the receiving Party or its contractors.
5. Recognizing that "industrial property of a proprietary nature," as defined above, may be necessary for the conduct of a specific cooperative activity or may be included in an exchange of information, such property shall be used only in the furtherance of LMFBR programs in the receiving country. Its dissemination shall, unless otherwise mutually agreed, be limited as follows:
- a. to persons within or employed by the receiving Party, and to other concerned agencies of the Government of the receiving Party; and
 - b. to prime or subcontractors of the receiving Party for use only within the territory of the receiving Party and within the framework of its contractor(s) with the respective Party engaged in work relating to the subject matter of the information so disseminated;

Provided that the information disseminated to any person under subparagraph a. or b. above shall bear a marking restricting dissemination outside the recipient's organization. Each Party shall use its best efforts to ensure that the dissemination of proprietary data received under this Agreement is controlled as prescribed herein.

ARTICLE 5

COPYRIGHTS

Copyrights of either Party or of cooperating organizations and persons shall be accorded treatment consistent with internationally recognized standards of protection. As to copyrights of material within the scope of paragraphs 1, 2, and 3 of Article 4 owned or controlled by a Party, each Party shall make efforts to grant to the other a license to reproduce copyrighted material.

ARTICLE 6

USE OF INFORMATION

The application or use of any information exchanged or transferred between the Parties under this Agreement shall be the responsibility of the Party receiving it, and the transmitting Party does not warrant the suitability of such information for any particular use or application.

ARTICLE 7

INVENTIONS AND PATENTS

1. With respect to any invention or discovery made or conceived in the course of or under this Agreement:

- a. If made or conceived by personnel of one Party (the Assigning Party) or its contractors while assigned to the other Party (Receiving Party) or its contractors, in connection with exchanges of scientists, engineers, and other specialists:
- (1) The Receiving Party shall acquire all right, title, and interest in and to any such invention or discovery in its own country and in third countries, subject to a nonexclusive, irrevocable, royalty-free license all such in countries to the Assigning Party, with the right to grant sublicenses, under any such invention or discovery and any patent application, patent or other protection relating thereto, for utilization in Liquid Metal Fast Breeder Reactor (LMFBR) development programs.
 - (2) The Assigning Party shall acquire all right, title, and interest in and to any such invention or discovery in its own country, subject to a nonexclusive, irrevocable, royalty-free license to the Receiving Party, with the right to grant sublicenses, under any such invention or discovery and any patent application, patent or other protection relating thereto, for utilization in LMFBR development programs.
- b. If made or conceived by a Party or its contractors as a direct result of employing information which has been communicated to it under this Agreement by the other Party or its contractors or communicated during seminars or other joint meetings, the Party making the invention shall

acquire all right, title and interest in and to such invention or discovery in all countries, subject to a grant to the other Party of a royalty-free, nonexclusive, irrevocable license with the right to grant sublicenses in and to any such invention or discovery and any patent application, patent or other protection relating thereto, in all countries for use in LMFBF development programs.

2. The preceding paragraph 1 of this article shall apply mutatis mutandis to design protection.
3. Neither Party shall discriminate against citizens of the country of the other Party with respect to granting any licenses or sublicenses under any invention or discovery pursuant to paragraph 2 above. It is understood that the licensing policies and practices of each Party may be affected because of the rights of both Parties to grant licenses within a single jurisdiction. Accordingly, either Party may request, in regard to a single invention or discovery or class of inventions or discoveries, that the Parties consult in an effort to lessen or eliminate any detrimental effect that the parallel licensing authorities may have on the policies and practices of the Parties.
4. Each Party shall assume the responsibility to pay awards or compensation required to be paid to its own nationals according to its own laws. In view of the provisions of Article 35 of the Japanese Patents Act of April 13, 1959, PNC shall, prior to the assignment of any Japanese personnel to a United States facility, secure from the Japanese employer of such personnel a commitment that the employer agrees to hold the

Government of the United States of America and its contractors harmless with respect to any claim of the employee for compensation under Article 35 of the Japanese Patents Act with respect to any inventions within the scope of paragraph 1 hereof, and PNC will pay any remuneration to the inventor under said Article 35.

ARTICLE 8

FINANCIAL TERMS

1. For the information to be received by PNC under this Agreement, PNC shall make a cash contribution to DOE of \$2 million. The monies contributed by PNC shall be spent by DOE in support of the DOE Fast Reactor Safety Program.
2. The cash contribution shall be made in U.S. dollars. It shall be paid in full within 30 days of receipt of the invoice by PNC, subject to approval by the Government of Japan.
3. Unless otherwise specifically agreed in writing, all costs resulting from cooperation under this Agreement shall be borne by the Party that incurs them.
4. It is understood that the ability of the Parties to carry out their obligations under this Agreement is subject to the availability of appropriated funds.

ARTICLE 9

EXCHANGE OF STAFF

The following provisions shall apply concerning exchanges of staff:

1. Whenever an exchange of staff is contemplated under this Agreement, each Party shall ensure the selection of adequate staff with skills and

competence necessary to conduct the agreed upon cooperation. Each such attachment of staff shall be the subject of a separate attachment agreement between the Parties.

2. Each Party shall be responsible for the salaries, insurance, and allowances to be paid to its staff.
3. Each Party shall pay for the travel and living expenses of its staff when staying at the establishment of the host Party unless otherwise agreed.
4. The host establishment shall arrange for comparable accommodations for the other Party's staff and their families on a mutually agreeable reciprocal basis.
5. Each Party shall provide all necessary assistance to the staff of the other Party as regards administrative formalities.
6. The staff of each Party shall conform to the general rules of work and safety regulations in force at the host establishment, or as agreed in separate attachment-of-staff agreements.

ARTICLE 10

DAMAGES

Both Parties agree that the following provisions shall apply concerning compensation for damages incurred under this Agreement. It is understood that such compensation shall be in accordance with the laws of the country on whose territory damages will have been incurred, except as otherwise provided.

1. Definitions

- a. "Staff" of a Party means the employees of the Party, its contractors and subcontractors performing services under this Agreement, and employees of these contractors and subcontractors performing services under this Agreement.
- b. "Equipment" or "Property" of a Party means the equipment or property owned by that Party, or by the contractor and subcontractors of that Party who perform services in connection with joint activities under this Agreement.

2. First and Second Party Damages

- a. Each Party shall alone be responsible for payment of compensation for damages suffered by its staff regardless of where the damages have been incurred, and shall not bring suit or lodge any other claims against the other Party for damages to its property, except as noted in paragraphs 2.b and 2.c.
- b. If the damage suffered by the staff of one of the Parties is due to the gross negligence or intentional misconduct of the staff of the other Party, the latter shall reimburse the former an agreed sum of monies which the former would be obliged to pay to the person or persons suffering the damages.
- c. If damages to the property of one Party are due to the gross negligence or intentional misconduct of the staff of the other

Party, the latter shall compensate the former for the damages suffered.

3. Third Party Damages

a. By Defective Equipment

Damages caused to the staff or property of a Third Party by defective equipment of a Party shall be compensated for by the Party to which the equipment belongs, except as noted in paragraph 3.c.

b. By Staff

Damages caused to the staff or property of a Third Party by the staff of a Party shall be compensated for by the Party in whose territory the damages occurred, except as noted in paragraph 3.c.

c. Gross Negligence or Intentional Misconduct

If damages referred to in paragraphs 3.a and 3.b were due to the gross negligence or intentional misconduct of the staff of a Party, that Party shall bear the financial responsibility in regard to the Third Party.

d. Damage by Third Party

In the event of damage of any kind caused by a Third Party to the staff or property of one or both of the Parties, each of these, upon the request of the other Party, shall render it aid in the corroboration of claims on the Third Party.

e. Resolution of Questions

The Party on whose territory the damage was incurred shall, in consultation with the other Party, take upon itself the resolution, with the Third Party, of all questions connected with the determination of the causes, extent and necessity for compensation for damages incurred. Any such resolution shall have the concurrence of the other Party. After determining the extent of the damages, both Parties shall decide, between themselves, the questions relating to compensation for damages incurred.

4. In the event of any dispute between the two Parties, a Committee shall be appointed by the Parties, with equal representation. The conclusions of the Committee shall be presented to DOE and PNC who will review the conclusions and arrive at a mutual agreement concerning final disposition.
5. The foregoing provisions of this Article shall have no applicability to damages caused by a nuclear incident, as defined by the laws of the countries to which the Parties belong. Compensation for damages caused by such nuclear incident shall be in accordance with the laws of the countries of the Parties.

ARTICLE 11

MISCELLANEOUS

1. The provisions of this Agreement shall not affect the rights or duties of the Parties hereto under other agreements or arrangements. This Agreement also in no way precludes commercial firms or other legally constituted enterprises in each of the two countries from engaging in commercial

dealings in accordance with the applicable laws of each country; nor does it preclude the Parties from engaging in activities with other Governments or persons, except that industrial property of a proprietary nature shall have limited dissemination as set forth in Article 6, paragraphs 5 and 6, of the Agreement. Moreover, it is expected that the present Agreement should facilitate industrial and commercial exchanges in the field of the LMFBF between the firms of the countries of the Parties with a view to mutual benefits from such exchanges for both countries.

2. Cooperation under this Agreement shall be in accordance with laws and regulations of the respective countries. All questions related to the Agreement arising during its term shall be settled by the Parties by mutual agreement.
3. In the event that, during the period of this Agreement, the nature of either Party's LMFBF program should change substantially, whether this be by substantial expansion, reduction, transformation, or amalgamation of major elements with the LMFBF program of a Third Party, either Party shall have the right to request revisions in the scope and/or terms of this Agreement.
4. All joint activities not completed at the termination of this Agreement shall be continued until their completion under the terms of this Agreement.

ARTICLE 12PERIOD OF AGREEMENT

This Agreement shall take effect February 10, 1982, and shall remain in force until February 9, 1983.

Done at Tokyo in duplicate this 12th day of March, 1982.

FOR THE UNITED STATES DEPARTMENT
OF ENERGY

FOR THE POWER REACTOR AND NUCLEAR
FUEL DEVELOPMENT CORPORATION
OF JAPAN

Signature: B.D. Hill

Signature: Takayasu Sasaki

NAME: B. D. Hill

NAME: T. Sasaki

TITLE: U.S. DOE Representative

Manager
Project Planning and
Management Division
TITLE: PNC

APPENDIX A

The SAS4A Computer Code

The initial version of the SAS4A computer code was developed at ANL/Chicago late in 1980. It is undergoing continued development and validation at ANL. Its output is utilized in the analysis of core neutronic-thermal-hydraulic behavior during initial phases of a postulated whole-core accident. The code is written in Fortran and reduced to tape--in which form it would be exchanged.

The SAS4A code is the latest in the SAS series of LMFBR whole-core accident codes. It completely supersedes the current production version, SAS3D. It provides a detailed modeling (mathematical analogs of selected single phenomena) capability of the thermal, hydraulic, and neutronic response of an LMFBR core and the thermal and hydraulic response of the balance of the primary system to undercooling and overpower accidents. The accidents can be tracked from the steady-state pre-accident conditions up through coolant boiling and fuel pin disruption to the point where either the core is in a damaged but coolable and subcritical state or the disruption is spreading beyond subassembly hexcan boundaries. The core is modeled as multiple parallel flow paths (channels), with each channel representing one or more similar subassemblies. Detailed models of fuel pin heat transfer and coolant flow, fuel pin mechanical response, coolant voiding, cladding relocation, and fuel pin disruption and relocation in both voided and unvoided channels are included, with the neutron kinetics being treated with a two- or three-dimensional time-dependent multigroup diffusion theory model.

APPENDIX B
EXPERIMENTAL VERIFICATION PROGRAM

The models in the SAS4A computer code are based on knowledge gained from more than 12 years of analysis and in-reactor and out-of-reactor experimental programs. A major part of the code verification efforts to follow the completion of this code will consist of making certain that the models are capable of properly predicting the course of subsequent validating experiments. A large backlog of data exists which will be used to verify the new codes. Additionally, the experimental programs planned for the years 1981-1984 are being carefully designed to complement and supplement earlier experimental programs in providing the data required to verify the codes. As such, these experimental programs are considered an integral part of the code verification effort. During the period that this agreement is in force, PNC assignees may participate in the planning and pre- and post-test analyses of the experiments and will have access to the experimental data.

The TREAT in-reactor experiment program conducted at Idaho (ANL-West) will provide data to be used in the verification of the SAS4A code. Included in the program for the years 1981-1984 are both single- and seven-pin tests in flowing sodium simulating both loss-of-flow and transient overpower accident conditions. These will be complemented by phenomenological tests employing short segments of fuel pins which will provide detailed information on fuel disruption modes. For the period covered by this agreement, PNC will have access to the data from all of these tests except for those in the PFR/TREAT test series which use UK-designed fuel pins.

These in-reactor tests will be complemented by a number of out-of-reactor tests conducted at ANL/Chicago which will examine core disruptive accident initiating phase and transition phase issues. The tests include direct-electric-heating tests on quartz- and stainless-steel-clad fuel pins at ANL. Sodium boiling issues will be addressed by tests in the OPERA Facility at ANL. Tests in the upgraded CAMEL Facility at ANL will address post-pin failure fuel-coolant interaction, blackage formation, and coolability issues for transient overpower accidents with bundles consisting of up to 37 simulated fuel pins.

- E. The JCC instructs each of the Working Groups that future recommendations to the JCC should not contain items addressing specific meetings and dates. The Working Groups are further instructed that in determining meetings, visits and other collaborative work, suitability of plans and availability of funding be considered before final agreement on these activities is reached. The Working Groups are advised that the JCC is interested in reports for information of activities and future plans.
- F. It was agreed that the next JCC meeting be held in the United States in the fall of 1983.

4. Discussions

Discussions were held on the status of the Japanese FBR Program, the status of the US FBR Program, and the overall status of the DOE/PNC cooperation. The JCC was encouraged by the progress that has been made. Detailed reports in these areas are listed in Appendix C.

FOR THE POWER REACTOR AND
NUCLEAR FUEL DEVELOPMENT CORP.

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Keiichi Mochizuki
Executive Director, PNC

FOR THE UNITED STATES
DEPARTMENT OF ENERGY



Gordon L. Chipman
Deputy Assistant Secretary
for Nuclear Reactor Programs
USDOE

May 14, 1982